DACOM MODEM FOR SCHOOLS

USER GUIDE

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IMPORTANT

The information contained in this user guide only refers to Dacom's autodialling modem model number DSL2123-AD with internal software level ADB 1.1 BT.

Should you need to check, you will find the software revision level shown on the EPROM chip located on the main circuit board. This may be accessed by removing the four cover securing screws. (two each side of the modem).

Before removing the cover it is important to observe the following precautions:-

1. Swith of modem and remove plug.
2. Disconnect modem from telephone line.
3. Do not touch any components inside the modem.
   (Electro static discharge precaution).

Your modem will carry a label on the top cover with the following wording:-

DTI SCHOOLS PROJECT

This modem is an all British designed and produced product. It was designed and built at:-

DACOM SYSTEMS LTD
SUNRISE PARKWAY
LINFORD WOOD
MILTON KEYNES
MK14 6LU
UNITED KINGDOM
Telephone (0908) 675511

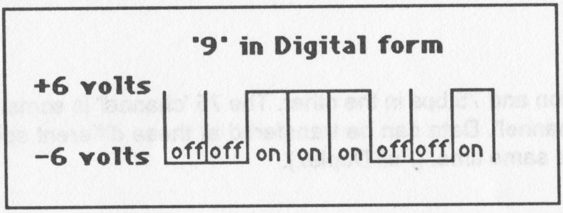
SECTION 1

What is a modem?

WHAT IS A MODEM?

Data communications has over the years developed a mystique all of its own. Dial up data communications is, in fact, very straight forward.

The signals produced by your computer are digital in nature. This information is conveyed in a series of on-off pulses that are each of a constant amplitude. A '9' for example in its digital form is:-



OK so far so good, the problems come when we want to send this signal up a telephone line.

It must be remembered that the telephone network was started long before computers were thought of and was designed to carry a completely different type of information, that is, the human voice. We don't speak to each other in a series of on off's, we use a continous range of sounds that change in both pitch and loudness. As a result the public telephone network is crammed with all sorts of amplifiers, coils, repeaters etc that can handle this type of analogue or voice signal but refuse to pass digital signals.

To allow your computer to communicate with other computers over the public switched telephone network it is necessary to use a device that will convert the digital signals of your computer to analogue signals, and analogue signals back to digital. This device is a **MODEM**. The word modem is an acronym for modulator-demodulator, the process of converting your signals.

The modem you now have is capable of sending and receiving data using the V21 and V23 specifications. These specifications are recommended by special study groups based in Geneva known as CCITT. (Comite Consultatif International Telegraphique et Telephonique). The recommendations for modems are known as the CCITT 'V' series. A brief description of the different types of connection follows.

V21

300 bits per second (bps) full duplex operation. i.e. data can be transfered at 300 bits per second in both directions at the same time. One modem needs to operate as the 'originate' and the other as the 'answer' so that the modems know which tones to use.

V23

1200 bps in one direction and 75 bps in the other. The 75 'channel' is sometimes known as the 'back channel'. Data can be transfered at these different speeds in both directions at the same time. (Full Duplex).

HALF DUPLEX

Half duplex is selected by the HDX command. V23 mode is selected, but only one channel is in use at any one time.

PSEUDO DUPLEX

This is full duplex V23, but the two modems will arbitrate between themselves over which modem transmits at 1200bps and which transmits at 75bps at any one time. Because of this, many applications can regard the modem link as being 1200bps full duplex.

SECTION 2

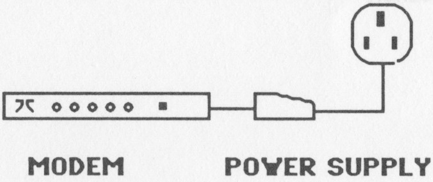
Unpacking and using.

UNPACKING

In your modem box you will find a power supply designed for this modem. One lead contains the 13A mains plug and the other a 5 pin "domino" plug that mates with the socket at the rear of the modem. You will find that the plug may be inserted in either of two ways to its socket, this is normal, the modem will function either way.

IMPORTANT *please read the following notes:-*

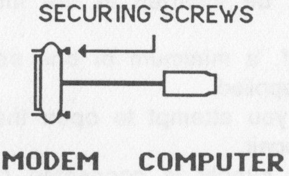
1. "Domino" plug **MUST** be inserted in the modem before power is applied.
2. If power is switched off, a minimum of one second should elapse before power is re applied.
3. On no account should you attempt to open the transformer module for inspection or repair.
4. Ensure that the power supply is connected ONLY to the modem and to NO OTHER DEVICE.
5. Note the label regarding cables at the rear of the modem.



Your modem has a 12 months parts and labour warranty. Please read the 'FOR YOUR PEACE OF MIND' card that is included in the modem box. Please retain the modem packing material. This should be used to return your modem in the unlikely event that your modem should fail.

CONNECTION

The next step to take to enable you to use your modem is to connect your terminal or computer. For this you will need a V24/RS232 cable. This cable is supplied with your modem. It has a 'D' type connector at one end and a 5 pin DIN plug at the other. The 5 pin DIN plug is connected to your computer and the 25 way 'D' type is connected to your modem. Ensure that the securing screws hold the plug firmly in the modem.



The cable supplied will be the one requested by your school or local education authority. It will be suitable for either:-

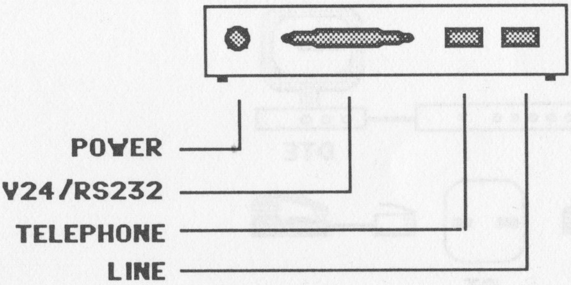
A. BBC micro.

B. RML 380Z

C. RML 480Z

ENSURE THAT ONLY THE CABLE SUPPLIED WITH THE MODEM IS USED WITH THE CORRECT COMPUTER.

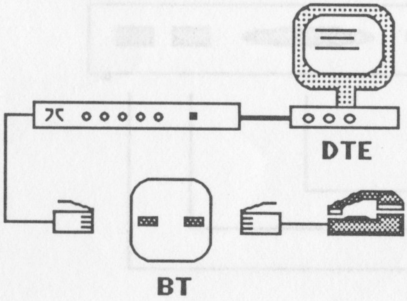
The final connection necessary before using your modem is to connect up to a telephone line. At the rear of the modem you will find a 2 metre lead with a BT series 600 style jack plug, this is simply plugged into the BT wall socket. Also at the rear of the modem you will find a 600 style socket which can be used as a useful position to connect your telephone. This is known as a series connection through the modem. If you wish your telephone to be connected in parallel with the modem contact your local British Telecom sales office and ask for a secondary line jack socket to be installed. The modem may then be plugged into this additional socket whilst the telephone will remain connected to the primary jack socket. This is the British Telecom approved method of parallel connection.



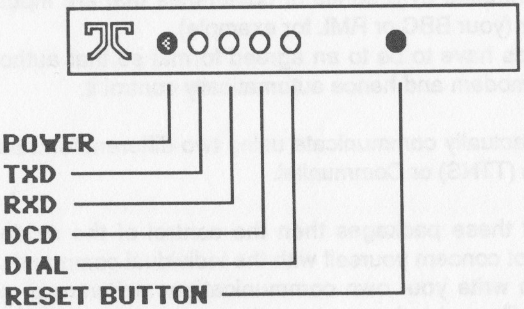
As an alternative, a series 600 dual outlet adaptor can be used by inserting it into the British Telecom wall socket. This provides two outlets, one for the telephone and one for the modem. These adaptors are available from your supplier, or electronic supply companies such as Farnells or RS Components. Some High Street shops such as Tandy, Boots and Woolworths may stock this adaptor.

Please note..... If you are using a parallel connection it is important to ensure that the telephone handset is on its cradle during data calls, if not, any room noise will interfere with the data transfer.

All that remains now is to check your connections and switch on.



FRONT PANEL



POWER
This glows red to indicate that power is applied to the modem.

TXD
This flashes in time with the data you are sending.

RXD
This flashes in time with the received data.

DCD
This will switch on to indicate that a carrier signal has been received from another modem.

DIAL
This will flash in time with the numbers being dialled.

RESET
Depressing this button interrupts and stops the software routine in the modem.

USE OF THE MODEM

The Dacom modem is controlled by a series of commands that are input to it from an attached computer (your BBC or RML for example).
Obviously these commands have to be to an agreed format so that authors of software can "talk" to the modem and hence automatically control it.

Your Dacom modem can actually communicate using two different formats. i.e. Times Network for Schools (TTNS) or Communitel.

If you are using either of these packages then the control of the modem is automatic and you need not concern yourself with the individual commands.
If, however, you intend to write your own communications software or adapt other software then you will need to know about the commands in detail. The following pages explain both commands and the modem responses.

HOW TO DIAL A NUMBER

Simply key in the following sequence and your Dacom modem will dial the number for you.

0 1 2 3 4 5 RET

In this example the modem will dial the number 012345. Should you be dialling from a PABX, you will most probably have to dial a number to get an outside line, useually a '9'. To do this, type in the following sequence:-

9 ; 0 1 2 3 4 5 RET

In this case the ';' will insert a two second pause whilst the exchange gets an outside line.

SECTION 3

TTNS compatible commands and responses

POWER ON CONDITIONS

You have arrived in this TTNS mode by either powering on the modem or by giving a RESET command. On power up the modem is already set up with the defaults that you require. (Pre set conditions). They are as follows:-

MESSAGES:	TTNS compatible messages enabled.
ECHO:	Echo of your commands disabled.
ANSWER:	Auto Answer disabled.
MODE:	Psuedo Duplex enabled.
PARITY:	Any responses will be in even parity.
DTE SPEED:	1200 bps.
RTS:	Ignored. (Except in half duplex).
CTS:	Flow control (except in half duplex).
DSR:	Low offline, high on connection.
DCD:	Low offline, high on connection.(except in HDX).
DIALLING:	Automatic selection of tone or pulse.
WAIT:	10 second dial tone timeout. 30 second answer tone timeout.

Please refer to the glossary of terms at the back of this book if you do not understand any of the abbreviations used

COMMANDS AND RESPONSES

Set 300 bps originate mode:- This is V21 mode, full duplex. Your signal frequencies will be set to the originate band.

V 2 1 T RET

Response from modem

CR LF &+++

Set 300 bps answer mode:- This again is V21 mode, full duplex. This time your signal frequencies will be in the answer band.

V 2 1 C RET

Response from modem

CR LF &+++

Set viewdata originate mode:- (1200 RX) This viewdata mode allows you to access the data base at 75 bps and receive data at 1200 bps.

V 2 3 T RET

Response from modem

CR LF &+++

Set viewdata answer mode:- (1200 TX) This viewdata mode would normally be used at the database end of a link. It will accept data at 75 bps and send it out at 1200 bps.

V 2 3 C RET

Response from modem

CR LF &+++

Set Pseudo Duplex mode (ONLY compatible with TTNS/Telecom Gold). This mode will allow you to send and receive your data at 1200. The modems will look to see who is sending the most data and will allow that link to operate at 1200. The other channel will be set to 75 bps.

V 2 3 P RET

OR

B B C RET

Response from modem

CR LF &+++

Set Half Duplex mode:- In this mode data will only be sent in one direction at a time, the data will be sent at a speed of 1200 bps.

V 2 3 H RET

Response from modem

CR LF &+++

Commands to set the parity of the modem responses. These commands allow you to specify what parity you wish the modem to use when it sends you your responses.

EVEN parity

E P RET

ODD parity

O P RET

NO parity

N P RET

The modem response to these commands is

CR LF &+++

Set modem to Auto Answer. This mode allows the modem to automaticaly answer a call.

A A RET

The modem response is

CR LF &+++

To set the modem to Manual Answer. The modem will not answer calls, it will inform you that a call is coming in with the ringing message, it is then up to you to manually connect to line.

M A RET

The modem response is

CR LF &+++

Command to drop a call:-Hold the control key down and then type 4 A's. The call will now drop. Remember any sequence of CTL/A's in your data will also drop the line.

CTL A A A A

The modem response will be

CR LF &DIS

Commands to connect to line. These are the manual connect commands, you will normally agree with the other party who will be originate and who will be answer. It will make no difference to the transfer of data which way round you are if you are set to V21 but if you are in the V23 mode you will use the 'C' command if you are set to V23C and the 'T' command if you are set to V23T.

1. **Answer mode**

   C RET

2. **Originate mode**

   T RET

The response to these commands is

CR LF &CTL

If you wish to switch to the Communitel command set then issue the following command. Please note that the response will be a Communitel response.

A L T RET

Communitel response is

CR LF &++

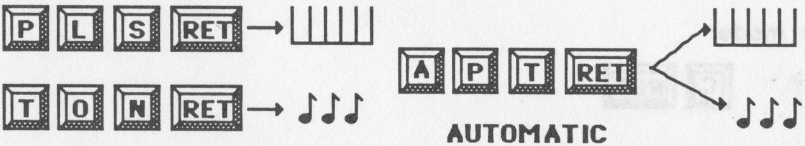
TTNS compatibility, the following command will ensure that you are using this command set. You would normally use this command if you have been using the Communitel facility within this modem and wish to revert to TTNS.

R E S E T RET

Modem response

CR LF &+++

Dial type commands:- The modem will default to the APT mode, this means that the modem will inspect the exchange that it is connected to and then use pulse or tone dialling as necessary. You may wish to use PLS or TON to disable the automatic selection.



PULSE OR TONE

AUTOMATIC SELECTION OF PULSE OR TONE

The modem response will again be

CR LF &+++

SECTION 4

TTNS compatible messages

MODEM MESSAGES

Once you have asked the modem to make a telephone call for you it will go through a series of operations to make the call. It will send you a series of progress messages so that you will be aware of what is going on. The following is a series of call progress messages and their meanings. In the following lists CR and LF indicate carriage return and line feed.

MESSAGE	MEANING
CR LF &DLG	Modem is waiting before dialling a number.
01...etc etc	Modem is dialling the number.
CR LF &WAT	Modem is looking for an answer tone.
CR LF &CTL	Modem is now connected to line.

There are various reasons for a call not being established, for example if the modem is not plugged into the BT line it will not detect the dial tone therefore will not dial the number. The following is a list of the different abandoned call messages and the reason for them being sent.

MESSAGE	MEANING
CR LF &NDT	Modem has not detected dial tone.
CR LF &NAT	Modem has not detected answer tone.
CR LF &DIS	Modem VF interface disconnected from line.
CR LF &NCD	Modem has detected no carrier.

The following is a list of miscellaneous messages that may be output from the modem.

MESSAGE	MEANING
CR LF &RNG	Modem has detected an incomming call.
CR LF &???	Modem does not recognise the input command.

AUTO ANSWER SEQUENCE

The modem detects any incoming calls and sends the message CRLF&RNG on the DTE interface. If the modem is set for manual answer, the modem will wait for a command from the DTE before proceeding. You may change mode before answering call or answer the call in a previously set mode. The power up default is auto sensing between pseudo Duplex and Viewdata answer. To answer a call in either of these modes, raise DTR in AA mode or send the modem the command

C RET

The response from the modem will be

CR LF & CTL

Which is saying that the modem is connected to line.

SECTION 5

Communitel compatible commands and responses

POWER ON CONDITIONS

You have arrived in this COMMUNITEL mode by typing the following command

A L T RET

As when you first switched on you will find that this mode also has its own set of defaults (power on conditions). A List of these conditions follows.

MESSAGES:	COMMUNITEL compatible messages enabled.
ECHO:	Echo of your commands enabled.
ANSWER:	Auto Answer enabled.
MODE:	V23T.
PARITY:	As previously set.
DTE SPEED:	1200 bps.
RTS:	Ignored. (Except in half duplex).
CTS:	Flow control (except in half duplex).
DSR:	Low offline, high on connection.
DCD:	Low offline, high on connection.(except in HDX).
DIALLING:	As previously set.
WAIT:	10 second dial tone timeout. 30 second answer tone timeout.

Please refer to the glossary of terms at the back of this book if you do not understand any of the abbreviations used

COMMANDS AND RESPONSES

Set 300 bps originate mode:- This is V21 mode, full duplex. Your signal frequencies will be set to the originate band.

V 2 1 T RET

Response from modem

CR LF &++

Set 300 bps answer mode:- This again is V21 mode, full duplex. This time your signal frequencies will be in the answer band.

V 2 1 C RET

Response from modem

CR LF &++

Set viewdata originate mode:- (1200 RX) This viewdata mode allows you to access the data base at 75 bps and receive data at 1200 bps.

V 2 3 T RET

Response from modem

CR LF &++

Set viewdata answer mode:- (1200 TX) This viewdata mode would normaly be used at the database end of a link. It will accept data at 75 bps and send it out at 1200 bps.

V 2 3 C RET

Response from modem

CR LF &++

Set Pseudo Duplex mode (ONLY compatible with TTNS/Telecom Gold). This mode will allow you to send and receive your data at 1200. The modems will look to see who is sending the most data and will allow that link to operate at 1200. The other channel will be set to 75 bps.

V 2 3 P RET

OR

B B C RET

Response from modem

CR LF &++

Set Half Duplex mode:- In this mode data will only be sent in one direction at a time, the data will be sent at a speed of 1200 bps.

V 2 3 H RET

Response from modem

CR LF &++

Commands to set the parity of the modem responses. These commands allow you to specify what parity you wish the modem to use when it sends you your responses.

EVEN parity

E P RET

ODD parity

O P RET

NO parity

N P RET

The modem response to these commands is

CR LF &++

Set modem to Auto Answer. This mode allows the modem to automatically answer a call.

A A RET

The modem response is

CR LF &++

To set the modem to Manual Answer. The modem will not answer calls, it will inform you that a call is coming in with the ringing message, it is then up to you to manually connect to line.

M A RET

The modem response is

CR LF &++

Command to drop a call:-Hold the control key down and then type 4 A's. The call will now drop. Remember any sequence of four CTL/A's in your data will also drop the line.

CTL A A A A

The modem response will be

EOT EOT EOT EOT CR LF DISCONNECTED CR LF

Commands to connect to line. These are the manual connect commands, you will normally agree with the other party who will be originate and who will be answer. It will make no difference to the transfer of data which way round you are.

1. Answer mode

C RET

2. Originate mode

T RET

The response to these commands is

CR LF CONNECTED CR LF

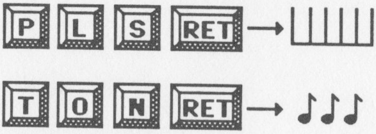
TTNS compatibility, the following command will ensure that you are using this command set. You would normally use this command if you have been using the Communitel facility within this modem and wish to revert to TTNS.

R E S E T RET

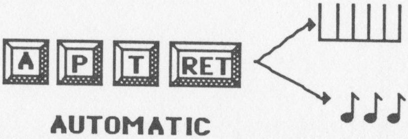
Modem response

CR LF &+++

Dial type commands:- The modem will default to the APT mode, this means that the modem will inspect the exchange that it is connected to and then use pulse or tone dialling as necessary. You may wish to use PLS or TON to disable the automatic selection.



PULSE OR TONE



AUTOMATIC SELECTION OF PULSE OR TONE

The modem response will again be

CR LF &+++

SECTION 6

Communitel compatible messages

MODEM MESSAGES

Once you have asked the modem to make a telephone call for you it will go through a series of operations to make the call. It will send you a series of progress messages so that you will be aware of what is going on. The following is a series of call progress messages and their meanings.

MESSAGE	MEANING
CR LF DIALLING	Modem is waiting before dialling a number.
01...etc etc	Modem is dialling the number.
CR LF WAITING	Modem is looking for an answer tone.
CR LFCONNECTED CR LF	Modem is now connected to line.

There are various reasons for a call not being established, for example if the modem is not plugged into the BT line it will not detect the dial tone therefore will not dial the number. The following is a list of the different abandoned call messages and the reason for them being sent. EOT is a code representing 'End Of Text'. CR and LF indicates carriage return and line feed.

MESSAGE	MEANING
EOT EOT EOT EOT CR LF NO DIALTONE CR LF	Modem has not detected dial tone.
EOT EOT EOT EOT CR LF NO ANSWER CR LF	Modem has not detected answer tone.
EOT EOT EOT EOT CR LF DISCONNECTED CR LF	Modem VF interface is disconnected.
EOT EOT EOT EOT CR LF NO DCD CR LF	Modem has detected no carrier.

The following is a list of miscellaneous messages that may be output from the modem.

MESSAGE	MEANING
CR LF RINGING CR LF	Incoming call detected.
EOT EOT EOT EOT CR LF WHAT? CR LF	Input command not recognised.

AUTO ANSWER SEQUENCE

The modem detects any incomming calls and sends the message CR LF RINGING CR LF on the DTE interface. If the modem is set for auto answer and DTR is high the modem will answer the call. If the modem is set to manual answer it will await a command from the DTE before proceeding.

SECTION 7

Glossarg of terms.

GLOSSARY OF TERMS

Asynchronous Transmission
Transmission in which each information character is individually synchronised, usually by the start and stop elements.

Attenuation
A decrease in decibels of power in a transmission.

BPS
(Bits per second) In serial transmission, the instantaneous bit speed within one character, as transmitted by machine.

Bandwidth
The difference in cycles per second, or herts, between the high and low frequencies of a band.

Bit
The smallest bit of information in a binary system of notation.

Character
The actual or coded representation of a digit, letter or special symbol.

Circuit
A communications path between two points.

C.R.C.
Cyclic redundancy check.

CTS
Clear to send. A signal on the V24 interface.

Data
A representation of facts, concepts or instructions in a formalised manner suitable for communication.

Data communication
The movement of information by an electrical transmission system.

Data Set
A device which performs modulation/demodulation and control functions to provide compatibility between business machines and communication lines for transmission over these lines.

DCD
Data carrier detected. sA signal on the V24 interface.

Demodulation
The process of retrieving an original signal from a modulated carrier wave. This technique is used in data sets to make communication signals compatible with business machine signals.

Dial-Up
The use of a dial, pushbutton telephone or automatic modem to initiate a station to station connection.

DSR
Data set ready. A signal on the V24 interface.

DTR
Data terminal ready. A V24 interface signal.

EIA
A stadard set of signal characteristics (time duration, voltage, and current) specified bu the electronic industries association.

Error Detecting and Feedback System
(ARQ) system. A system employing an error detecting code and so arranged that a signal detected as being an error automatically initiates a request for retransmission of the signal detected as being in error.

Full Duplex
Refers to a communications system capable of transmission in both directions simultaneously.

Handshaking
Exchange of predetermined signals for purposes of control when a connection is established between two modems. i.e. RTS, CTS.

Interface
A shared boundary, for example, the physical connection between two systems to two devices i.e. modem/EIA interface.

Line speed
The maximum data rate that can be reliably transmitted over a line.

Local loop
That part of a communications circuit between the subscribers equipment and the equipment in the phone company exchange.

Modem
Acronym for modulator/demodulator.

Modulation
The process of varying some characteristic of the carrier wave in accordance with the instantaneous value of samples of the intelligence to be tranmitted.

Parity check
Addition of non information bits to data making the number of ones in a grouping of bits either always even or always odd. This permits detection of bit groupings which contain single errors.

RTS
Request to send. Signal on the V24 interface.

Start element
The first element of a character in certain serial transmissions, used to permit synchronisation.

Stop element
The last element of a character in certain serial transmissions, used to insure recognition of the next start element.

Terminal
1. A point at which information can enter or leave a communications network.
2. An input/output device to receive or send source data in an environment associated with the job to be performed, capable of transmitting entries to and obtaining output from the system of which it is a part.